PIX

BELTS & HOSES

USER'S GUIDE HOSE

GLOBAL ACCEPTANCE - THE QUALITY WAY

Corporate Office & Works (J-7, Hingna, MIDC)

K-36 MIDC Plant, Nagpur

Bazargaon Plant

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Profile

PIX TRANSMISSIONS LIMITED, is engaged in the manufacturing of wide range of world class quality V-Belts and Hoses to suit various power drive needs.

Its comprehensive manufacturing setup at Nagpur and Bazargaon conforms to the stringent ISO 9001:2000 & TS:16949 standards and is designed to include all sophisticated manufacturing and testing facilities under one roof.

The wide range of Hoses manufactured by PIX have found their acceptance in various industries eg. Mining, Earthmoving, Moulding, Logging, Agriculture, Drilling, Petroleum, Waste/Refuse, Crane, Railroad, Manufacturing, Construction, Pulp and Plywood Mills.

Infrastructure Advantage

- State-of-art Braiding Machines
- Highly advanced & sophisticated Impulse Testing Machine
- Testing facilities for Proof Pressure, Burst Pressure, Changing Length, Flame Resistance
- State-of-art Ozone Chamber

Hose Assemblies and End Fittings

PIX has got a full fledged manufacturing facility for producing wide range of high quality End Fittings and Hose Assemblies.

The facility includes -

- CNC machinery for manufacturing of End Fittings
- Crimping machine, Cutting machine, Skiving machine
- Proof Pressure Testing Machine for assemblies
- Hose assembly cleaning facility
- Metal Crack Detection Machine for incoming raw material

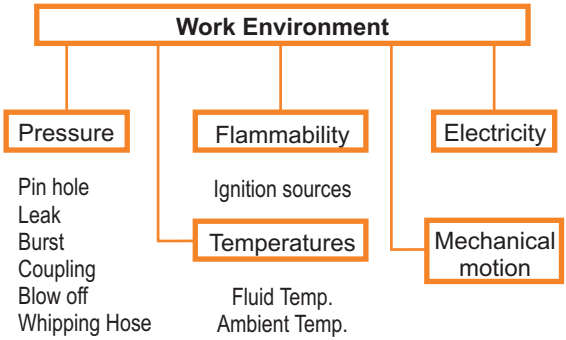
Certifications

IBExU Institut für Sicherheitstechnik GmbH
Directive 94/9/EC
Test Report No. : IB-03-4-934
Ⓔx II 2GD c IIB X

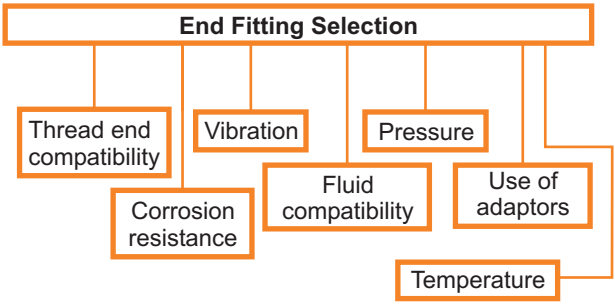
US Department of Labor
Mines Safety & Health Administration (MSHA)
Marking No. : MSHA IC-226

Work environment

The most effective and the best way to maintain the safer work environment can be achieved by knowing your equipment properly. The chart below list down the factors one need to look in the equipment.



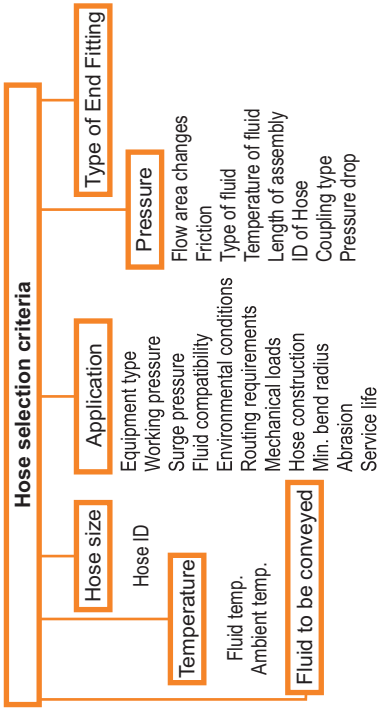
End Fitting Selection Criteria



Hose selection criteria

Hose selection criteria

The following factors are to be considered to ensure that the best hose is selected for the desired application.



Inspection

Inspection Procedure
To achieve the best from your equipment it is imperative that a maintenance schedule be set up and ascertain that the periodic inspections are carried out to prevent the substantial losses which may incur at later stages.

Normally it is considered a safer practice to inspect the equipment every three months. However the frequency of inspection will be by large governed by the following factors.

- Criticality of the equipment
- Pressure range
- Temperature range
- Hazard value of working media
- Type of usage

Procedure
1. Turn the power off
2. Place the components in neutral position
3. Remove inspection panels and examine hose and fittings for damages and leaks
4. Repair or replace as needed
5. Inspect the associated hydraulic components
6. Re-install the inspection panels
7. Turn the power on
8. Look out for the proper working of equipment

Protecting the hose

Protecting the Hose
It is imperative that for an efficient running of the system the hoses have to be duly protected from surrounding factors which can cause potential damage to the hose leading to the failure of the equipment. The following simple techniques can help in protecting the hose.

Bundling
Only similar construction hoses need to be bundled together. Never bundle high and low pressure hoses together.

Mechanical movement of the hose should be considered when bundling the hoses together.

Hoses in same bundle should bend in the same plane only.

Sleeving
Sleeving is generally done to protect the hose from abrasion for use in bundling and to prevent the operator from injury in case of hose failure.

Spring Guards
Spring guards are generally used to protect the hose from abrasion and to provide stability when bundled together.

Installation

Bend Restrictors
Bend restrictors are generally PVC pipes and are installed near the coupling ends to reduce the bending stresses in the hose.

Hose Installation Procedure
1. Clean the surrounding area where the connections are to be made so that no dirt or grime enters the open ends of hose and of the equipment.

2. Install adaptors into ports, if they are used.

3. Lay the hose assembly into routing position to verify the length and correct routing.

4. Screw one end of the hose fitting onto the port. If the hose assembly uses an angled fitting then the angled end must be fitted first to ascertain proper orientation.

5. Screw the other end of the hose fitting without twisting the hose.

6. Properly torque both ends.

7. Run the hydraulic system to circulate oil under low pressure and reinspect for leaks.

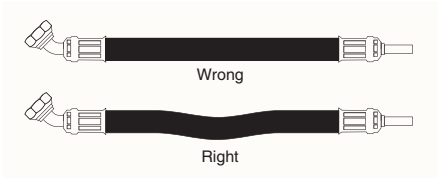
Installation

Installation

Proper hose installation is essential for satisfactory performance. If hose length is excessive then the appearance of the installation will be unsatisfactory and unnecessary cost of equipment will be involved. If the hose assemblies are too short to permit adequate flexing and changes in length due to expansion or contraction then hose service life will be reduced.

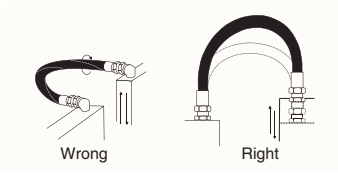
The following diagrams show proper hose installations which provide maximum performance and cost savings. Consider these examples in determining length of a specific assembly.

Proper Installation Procedure

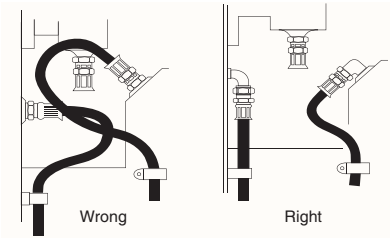


When the hose installation is straight, allow enough slack in hose line to provide for length changes which will occur when pressure is applied.

Installation

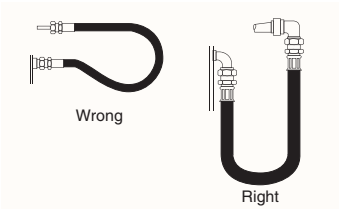


Prevent twisting and distortion by bending hose in same plane as the motion of the boss to which hose is connected.

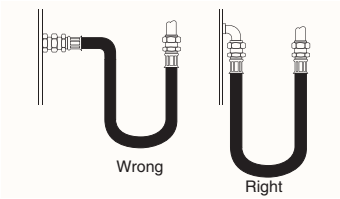


Route hose directly by using 45^0 or 90^0 adaptors and fittings. Avoid excessive hose length to improve appearance.

Installation

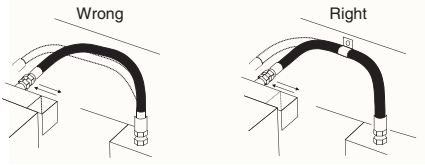


When radius is below the required minimum, use an angle adaptor to avoid sharp bends.

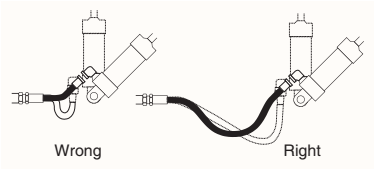


Use proper angle adaptors to avoid sharp twists or bend in the hose.

Installation

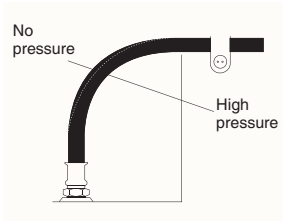


Avoid twisting of hose lines or bends in two planes by clamping hose at the change of plane.

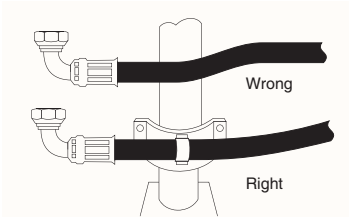


Adequate hose length is necessary to distribute movement on flexing applications and to avoid abrasion.

Installation

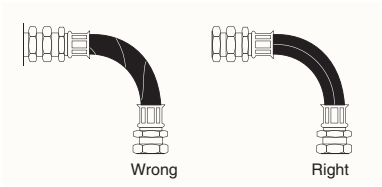


To allow for length changes when hose is pressurised do not clamp high at bends so that curves will absorb changes. Do not clamp high and low pressure lines together.

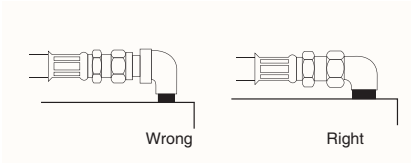


High ambient temperatures shorten hose life. Make sure that the hose is kept away from hot parts. If it is not possible insulate the hose.

Installation

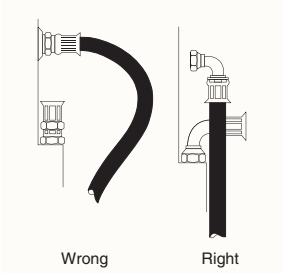


When installing hose, make sure it is not twisted. Pressure applied to a twisted hose can result in hose failure or loosening of connections.

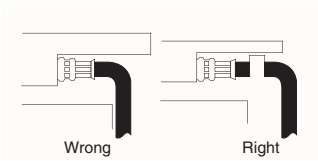


Reduce number of pipes or thread joints by using proper hydraulic adaptors instead of pipe fittings.

Installation

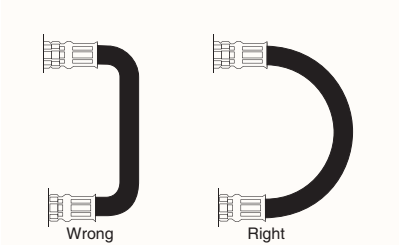


Elbows and adaptors should be used to relieve strain on the assembly and to provide neater installations, to facilitate inspection and maintenance at an ease.



Run hose in the installation so that it avoids rubbing and abrasion. Often clamps are required to support long hose runs or to keep hose away from moving parts. Use clamps of the correct size. Too large clamp allows hose to move inside the clamp and causes abrasion.

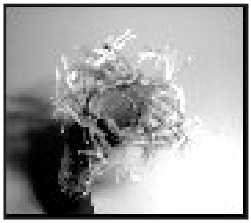
Installation



To avoid hose collapse and flow restriction, keep the hose bend radius as large as possible. Refer the hose specification tables for minimum bend radius.

Types of failure

Cover cracking due to Ozone



Hose Fraying

Bulging near End Fitting

Cover wear-off due to abrasion

Troubleshooting

Types of failure	Causes
Hose tube is hard and cracked	High temperature causing the rubber to over cure Reaction of Oxygen with aerated oil Cavitation occurring inside the tube
Hoses cracked internally and externally even though it is flexible at room temperature	Operating temperature below -40^{0}c
Bursting of the hose and random breaking of braiding wires along the length	High frequency pressure impulse conditions
Bursting of hose at more than one place	Pressure has exceeded the minimum burst pressure
Hose has burst, examination reveals that the wire has rusted and the cover has been cut	Cover basically protects the hose, elements that damage the cover may be abrasion, cutting, acid salt water, heat or extreme cold
Hose has burst on the outside bend and appears to be elliptical in the bent section	Violation of the minimum bend radius
Hose appears to be flattened out. Has burst in this area and appears to be twisted	Improper installation of the hose causing the twisting of hose primarily and causing the burst at such bends.

Troubleshooting

Types of failure	Causes
Bursting of hose at about 6 to 8 inches away from End Fitting	Improper crimping of the End Fittings allowing the moisture to be trapped between inner and outer liner, causing corrosion of the braiding wires
Blisters on the cover of hose	Pin holes in the hose tube, allowing the high pressure oil to seep in between the gaps
Fitting blew off at the end of the hose	Improper crimping or wrong End Fitting, improper stack allowance while installing
Swelling and deterioration of the hose	Incompatibility of the hose with the working substance
Bursting of the hose with cover being badly deteriorated and cracking of rubber	Old Hose
Hose is badly flattened out in the burst area	Sharp bend
Hose is not burst but leaking profusely	Erosion has taken place
Elongation of the hose	Insufficient support to the hose

Product range

High Pressure Hydraulic Hose

Specification Followed	Type of Hose	Nominal Hose I.D.
DIN-20022/ EN 853/ SAE J-517	1ST/R1A 2ST/R2A 1SN/R1AT 2SN/R2AT	1/4", 5/16", 3/8", 1/2", 5/8", 3/4", 1", 1-1/4", 1-1/2" & 2" 1/4", 5/16", 3/8", 1/2", 5/8", 3/4", 1", 1-1/4", 1-1/2" & 2" 1/4", 5/16", 3/8", 1/2", 5/8", 3/4", 1", 1-1/4", 1-1/2" & 2" 1/4", 5/16", 3/8", 1/2", 5/8", 3/4", 1", 1-1/4", 1-1/2" & 2"
BRITISH COAL BOARD SPEC. (BCS-174)	Two wire braid hose	1/4", 3/8", 1/2", 3/4",1", 1-1/4", 1-1/2 & 2"

High Pressure Compact Hose

Specification Followed	Type of Hose	Nominal Hose I.D.
EN-857	1SC 2SC	1/4", 5/16", 3/8", 1/2", 5/8", 3/4" & 1" 1/4", 5/16", 3/8", 1/2", 5/8", 3/4" & 1"

Hot Water Standard/Compact Hose

Type of Hose	Nominal Hose I.D.
Single/Double Wire braided Hot Water	1/4", 5/16", 3/8" & 1/2"

Available in Black & Blue colour

Krishi/Agriculture Hose

Type of Hose Followed	Nominal Hose I.D.
Single Wire braided	1/2"

Product range

Rock Drill Hose

Specification Followed	Type of Hose	Nominal Hose I.D.
IS:446-1987 Type -3	Wire braided	1/2", 5/8", 3/4", 1", 1-1/4", 1-1/2" & 2"

LPG Hose

Specification Followed	Type of Hose	Nominal Hose I.D.
IS:9573:1998 Type-4	Wire braided	5/16" *, 3/8" & 1/2"

Note : 5/16" hose in Orange colour, Others available in Black colour.

Gasoline Hose

Type of Hose	Nominal Hose I.D.
Wire braided	5/8", 3/4" & 1"

CNG Hose (Wire braided)

Specification Followed	Type of Hose	Nominal Hose I.D.
SAE-J30 R6	Wire braided	5/16"

Product range

Steam Hose

Specification Followed	Type of Hose	Nominal Hose I.D.
BS-5342 : 1985/ IS 10655, Type-2 & Type -3	1A	1/2", 5/8", 3/4", 1", 1 1/4", 1 1/2"& 2"
	2A	1/2", 5/8", 3/4", 1", 1 1/4", 1 1/2"& 2"
BS-5342:1985	1B	1/2", 5/8", 3/4", 1", 1 1/4", 1 1/2"& 2"
	2B	1/2", 5/8", 3/4", 1", 1 1/4", 1 1/2"& 2"

X'el XP High Pressure Hose (Exceeds EN 853 2SN)

Type of Hose	Nominal Hose I.D.
Double wire braided	3/8"*, 1/2"*, 5/8"*, 3/4" & 1"

* means sizes on request

X'el XT High Temperature Hose (-40^{0}c to +150^{0}c)

Type of Hose	Nominal Hose I.D.
One or Two wire braided	1/4", 5/16", 3/8", 1/2", 5/8", 3/4", 1", 1-1/4", 1-1/2" & 2"

MINIMUM BEND RADIUS IN INCHES

Size	Specifications										
Nominal Bore in Inches	SAE 100 R1A	SAE 100 R2A	SAE 100 R1AT	SAE 100 R2AT	DIN 1ST	DIN 2ST	DIN 1SN	DIN 2SN	BCS N2	EN 857 1SC	EN 857 2SC
1/4	4.0	4.0	4.0	4.0	3.9	3.9	3.9	3.9	3.9	3.0	3.0
5/16	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	3.4	3.4
3/8	5.0	5.0	5.0	5.0	5.1	5.1	5.1	5.1	5.1	3.6	3.6
1/2	7.0	7.0	7.0	7.0	7.1	7.1	7.1	7.1	5.9	5.1	5.1
5/8	8.0	8.0	8.0	8.0	7.9	7.9	7.9	7.9	--	6.0	6.7
3/4	9.5	9.5	9.5	9.5	9.4	9.4	9.4	9.4	9.1	7.1	7.2
1	12.0	12.0	12.0	12.0	11.8	11.8	11.8	11.8	11.8	9.0	9.8
1-1/4	16.5	16.5	16.5	16.5	16.5	16.5	16.5	16.5	15.0	--	--
1-1/2	20.0	20.0	20.0	20.0	19.7	19.7	19.7	19.7	17.7	--	--
2	25.0	25.0	25.0	25.0	24.8	24.8	24.8	24.8	23.6	--	–

Hose conversion factor

HOSE CONVERSION FACTOR

Dash	DN	Nominal Bore	
		Inch	mm
-04	06	1/4	6.40
-05	08	5/16	7.90
-06	10	3/8	9.50
-08	12	1/2	12.7
-10	16	5/8	15.9
-12	20	3/4	19.0
-16	25	1	25.4
-20	32	1-1/4	31.8
-24	40	1-1/2	38.1
-32	50	2	50.8

Formulae & factors

Formulae & Conversion Factors for Fluid Power Use

Quantity U.S. Unit	Customary	SI Unit	Conversion From U.S. to SI units	Conversion From SI to U.S. units
Area	Square inch (in^2)	Square Metre (m^2)	(in^2)x6.451x 10^4 = (m^2)	(m^2)x1550.003 = (in^2)
Force	Pound (lb_F)	Newton (N)	(lb_F)x4.4482 =(N)	(N)x2.2481x 10^{-1}=(lb_F)
Frequency	Cycles/Second (cps)	Hertz (Hz)	1(cps) = 1(Hz)	1(Hz) = (cps)
Length	Inch (in)	Metre (m)	(in)x2.540x 10^{-2}=(m)	(m)x39.370 =(in)
Mass	Pound (lb m)	Kilogram (Kg)	(lb m)x4.5359x 10^{-2}=(Kg)	(Kg)x2.2046 =(lb m)
Power	Electric Hosepower (HP)	Watt (W)	(HP)x7.460x 10^2=(W)	(W)x1.3405x 10^{-3}=(HP)
Pressure	Pounds/sq in (psi)	Newton/sq mtr (N/m^2)	(psi)x6.8948x 10^3=(N/m^2)	(N/m^2)x1.4504x 10^{-4}=(psi)
	(psi)	Pascal (Pa)	(psi)x6.8948x 10^3=(Pa)	(pa)x1.4504x 10^{-4}=(psi)
	(psi)	BAR (Bar)	(psi)x6.8948x 10^{-2}=(Bar)	(Bar)x1.4504x 10^1=(psi)
	(Bar)	(N/m^2)	(Bar)x100,000 =(N/m^2)	(N/m^2)x1.00x 10^{-5}=(Bar)
Temperature	Degrees Fahrenheit (^{0}F)	Degrees Celsius (^{0}C)	(^{0}F-32)/1.8 =(^{0}C)	(^{0}Cx1.8)+32 =(^{0}F)
Torque	Pound-inch (lb_F- in)	Newton-Metre (N-m)	(lb_F-in)x1.1298 x10^{-1}=(N-m)	(N-m)x8.8507 =(lb_F - in)
Volume	US Gallon (Gal)	Cubic Metre (M^3)	(Gal)x3.7854x 10^{-3}=(m^3)	(m^3)x2.6417x 10^2=(Gal)
		Litre (l)	(Gal)x3.7854 =(l)	(l)x2.6417x 10^{-1}=(Gal)
Work	Foot-Pound (Ft - lb_F)	Joule (J)	(ft-lb_F)x1.3558 =(J)	(J)x7.3756x 10^{-1}=(ft-lb_F)

Formulae & factors

Velocity of flow through pipes

$$V = \frac{GPM \times 0.3208}{A}$$

V = Velocity in feet per second
A = Inside opening area in (in^2)

Entrained air :
At room temperature standard hydraulic oil contains 8-9% air by volume

Heat generation :
BTU/hr = 1.5 x GPM x PSI
PSI = Pressure loss which does not produce work

Head pressure :
Oil creates a pressure due to its weight at 0.4 PSI per foot of depth

Pressure drop through pipes :

$$P = \frac{V \times F}{18300D}$$

P = Pressure drop per foot
V = Viscosity in SSU
D = Inner diameter (in)
F = Flow in GPM

Notes

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